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NASA/JAXA Ground Operations Working Group TIM #9

JEM EF Coolant Circulation GSE Layout Plan in SSPF high-bay

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Japan Aerospace Exploration Agency

IHI Aerospace

1. Objective

This document presents that the EF Coolant Circulation GSE (Chiller Unit) Layout Plan in the SSPF high-bay.

JAXA/IA has studied the EF chiller unit location during 2J/A launch site processing at KSC, and then propose to locate the EF chiller unit inside the SSPF.

2. Background

- **JEM PM TCS GSE includes chillers units.**
- **NASA/JAXA had coordinated to install the PM TCS chiller units outside the SSPF complying with following KSC recommendation.**
  - **Require an SSPF modification (Wall penetration)**
  - **Minimize concerns associated with operating the TCS chillers units at KSC**
  - **GSE Setup would be similar to that uses at MHI and TKSC facilities**

- **Also JEM EF TCS GSE includes a chiller unit.**
- **This GSE (including the chiller unit) has been used at clean work area in TKSC and / IA.**
- **JAXA/IA studied whether there are any concerns used the chiller unit in SSPF high bay or not, by comparing EF's and PM's.**

3. The EF Coolant Circulation GSE Overview

- **GSE Outline**

  This GSE is used to circulate the coolant to the EF active thermal control system loop through the BM (Berthing Mechanism).

  Function;

  - To control temperature of the coolant with the water heat exchanger

  - To control flow rate of the coolant with flow control valve

- **Schematics**

  Shown in Figure 1

- **Overview**

  Shown in Figure 2

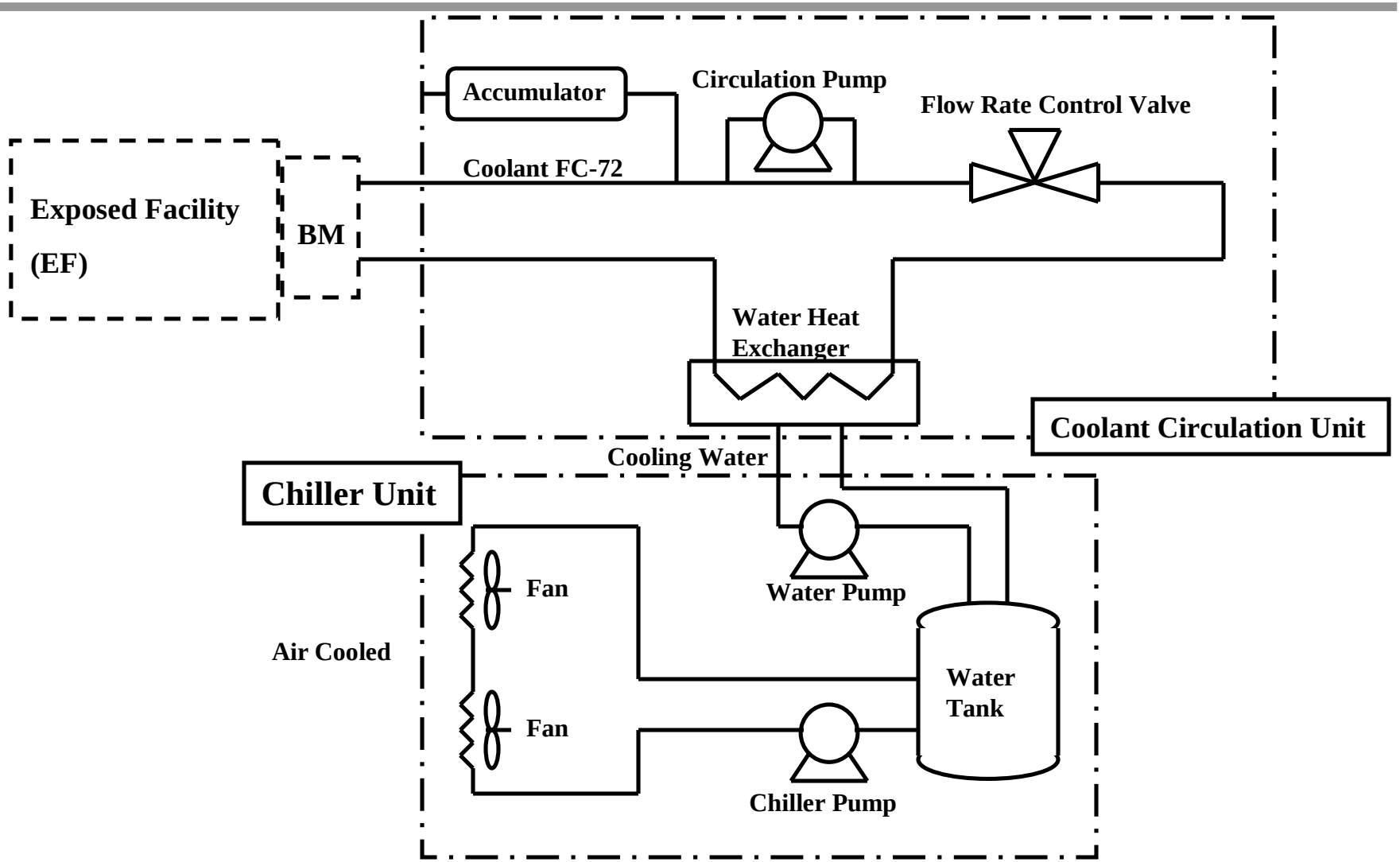

Figure 1 EF Coolant Circulation GSE Schematics

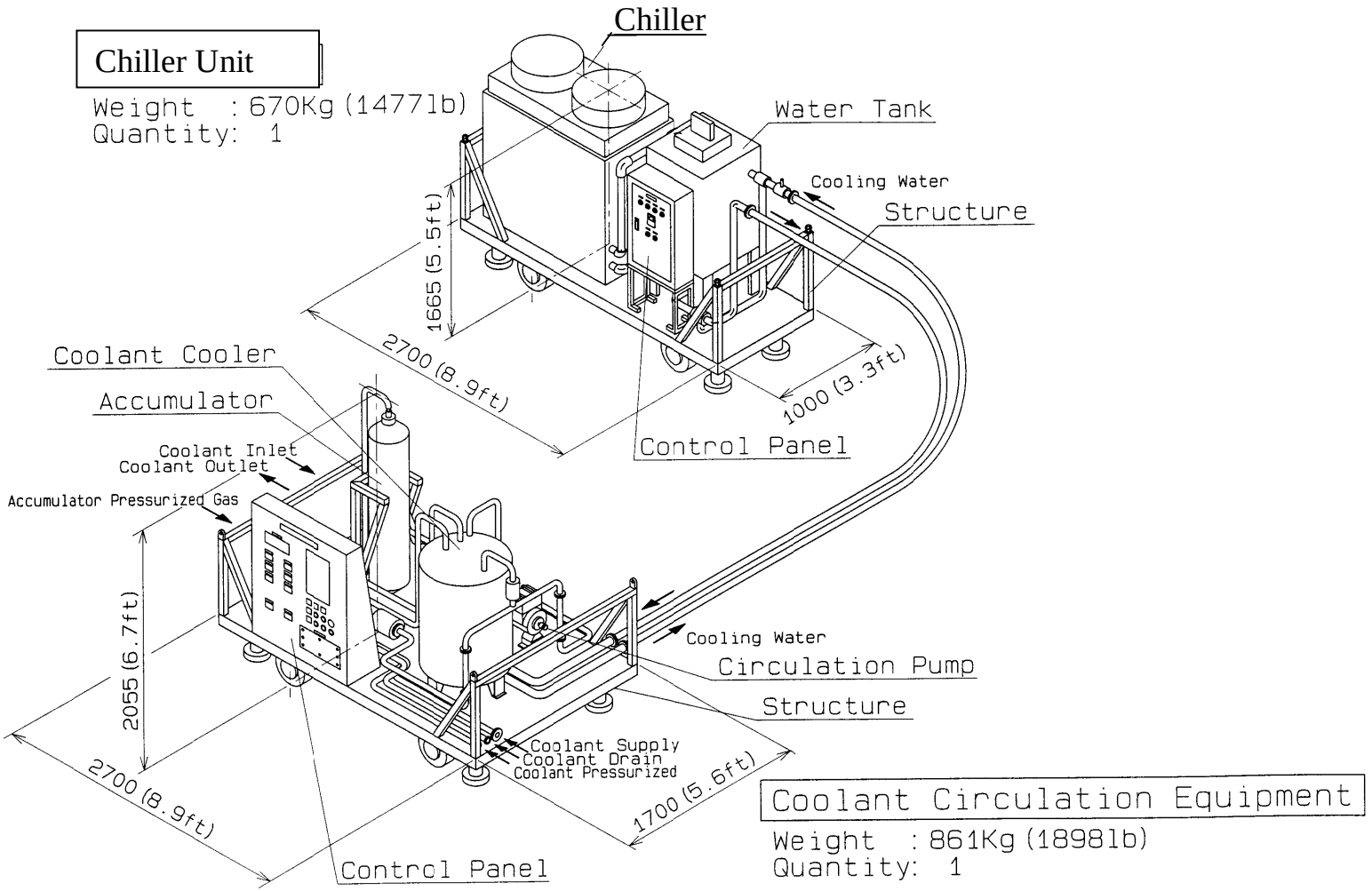

Figure 2 EF Coolant Circulation GSE Overview

4. SSPF Clean Work Area Compatibility Studies

Summary

Influence to SSPF	EF Chiller Unit	PM Chillers Units	Compatibility of the EF Chiller Unit with SSPF CWA (Level #4) environment
Radiant Heat to Air	From 1.0 kw to 11.0 kw (Max.)	25.9 kw	1.0 kw for EF bus equipment cooling 10.0 kw for maximum heat loads testing cases (duration; 2 or 3 days in KSC check-out process) It is considered that the radiant heat to air is within SSPF air conditioning capacity. See attachment-1 for duration and duty cycle of total radiant heat to air including the dry air generator unit.
Noise level	Max. 59 dBA*1	69 dBA	KHB1700.7 requires less than 85 dBA.
Cleanliness	Visible clean Used at clean work area	Used outside Facility	EF Chiller Unit has been operated in the contamination controlled facility (cleanliness level: FED-STD-209 class 100,000) without exceeding particle limits. Figure 3 shows that the chiller unit is located and operated inside TKSC clean room.

*1: Manufacturer's Data Sheet

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4. SSPF Compatibility Studies

Summary (cont.)

Influence to SSPF	EF Chiller Unit	PM Chillers Units	EF Chiller Unit compatibility with SSPF CWA (Level #4) environment
Disruption of air flow	Max. 160 m^3/min*1 -160 m^3/min @ambient temp. : >68F -80 m^3/min @ambient temp. : <68F SSPF Temp. : 65F to 77F	No specific data	TKSC clean room has not been experienced increasing particles, exceeding temperature ranges and also humidity ranges during EF testing periods. Per KCI-HB-5340.1, Payload Facility Contamination Control Implementation Plan, SSPF CWA (Level #4) permits Non-laminar air flow.
EMI/EME	To be measured	Measured	There has been no EMI/EME problems during TKSC operation periods. Before transport the GSE to KSC, EMI characteristics will be measured.

*1: Manufacturer's Data Sheet

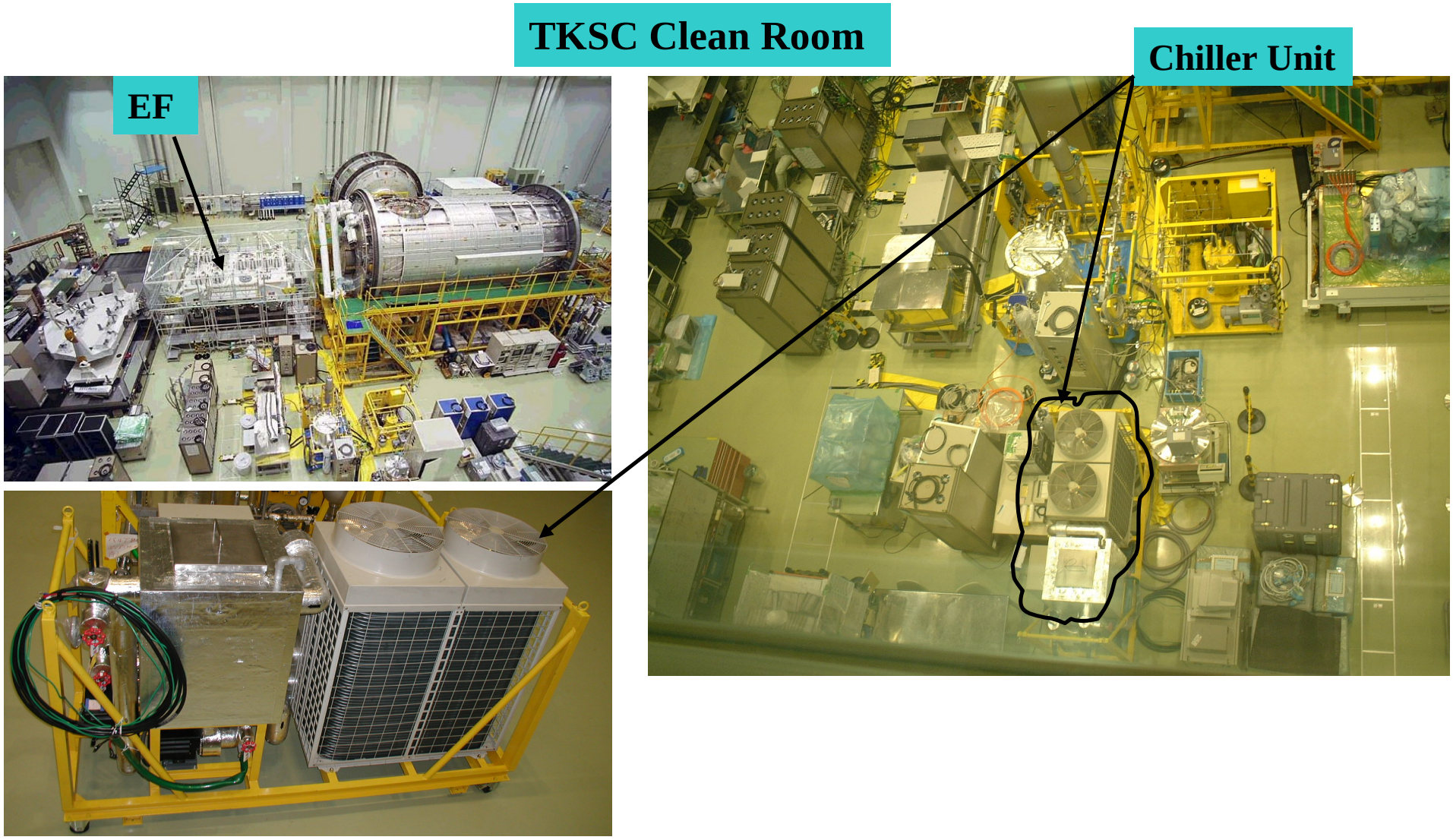


Figure 3 JEM overall testing layout in Tsukuba

5. Proposal

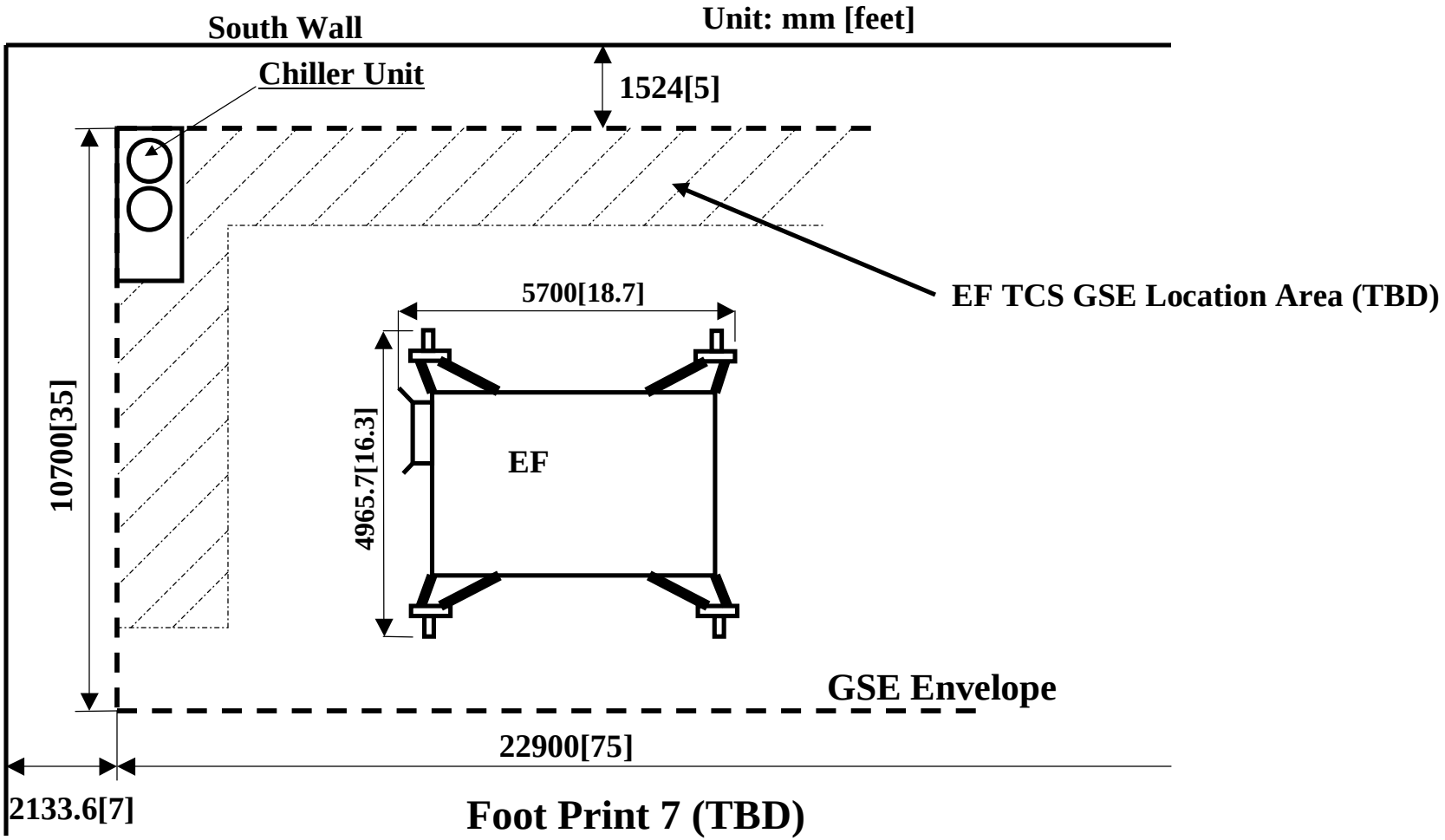
The EF chiller unit has been used inside the clean work areas of IA and also JAXA.

The EF chiller unit has been maintained its cleanliness.

The EF chiller unit is considered not to impact SSPF normal operation.

JAXA/IA propose to locate the chiller unit inside the SSPF high bay.

6. TCS GSE Layout Plan in SSPF High Bay (TBD)



Attachment-1 Duration and duty cycle of radiation heat to air

Case	Dry air generator Unit [7.7 kw]	EF bus equipment [1.0 kw]	Payload simulator [10 kw]	Total Radiant Heat to air [kw]	Operation duration [Days]	Duty Cycle [Hr/day]
A	On [7.7 kw]	Off	Off	7.7 [kw]	65	24
B	On [7.7 kw]	On [1.0 kw]	Off	8.7 [kw]	53	6
C	On [7.7 kw]	On [1.0 kw]	On [10 kw]	18.7 [kw]	2	6

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